Instruction Sheet
No. 31-0000M
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Installation Instructions for S&S Super Stock and Special Application Big Twin Crankcases

Safe Installation and Operation Rules:

Before installing your new S&S crankcases, it is your responsibility to read and follow the installation procedures in these instructions and follow the basic rules below for your personal safety.

- Read instructions thoroughly and carefully so all procedures are completely understood before performing any installation steps. Contact S&S with any questions you may have if any steps are unclear or any abnormalities occur during installation or operation of motorcycle.
- Consult an appropriate authorized H-D service manual for correct disassembly and reassembly procedures for any parts other than those outlined in these instructions.
- Use good judgement when performing installation and operating motorcycle. Good judgement begins with a clear head. Don't let alcohol, drugs or fatigue impair your judgement. Start installation when you are fresh.
- Be sure all federal, state and local laws are obeyed with the installation.
- Gasoline is extremely flammable and explosive under certain conditions and toxic when breathed. Do not smoke. Perform installation in a well ventilated area away from open flames or sparks.
- If compressed air is used during installation, be particularly careful. Compressed air and particles dislodged by compressed air are harmful to eyes and body. Wear protective goggles, and always direct air stream away from body parts such as hands and eyes. Never direct compressed air toward other people.
- When using solvents, degreasers and other chemicals during cleaning and installation, read manufacturer's instruction label for proper use. Exposure of some chemicals to skin, eyes and/or other body parts may be harmful. Many items are flammable and present a fire hazard. Use in well ventilated area and wear protective clothing when using them to avoid personal injury.
- If motorcycle has been running, wait until engine and exhaust pipes have cooled down to avoid getting burned before performing any installation steps.
- Before performing any installation steps disconnect battery to eliminate potential sparks while working on electrical components.
- Be sure all fuel lines, supply and overflow, are routed correctly and fuel line clamps are in place and tightened. Lines must not contact exhaust pipes or other extremely hot surfaces where they could melt or leak and catch fire.
- Before starting engine and riding motorcycle, be sure throttle opens and closes smoothly. Turn handlebars to left and test throttle. Then, turn bars to right and test throttle. To avoid possible loss of control of motorcycle and potential personal injury to yourself or others due to throttle sticking in open position, throttle must work smoothly and return to a fully closed position when hand is removed from throttle grip.
- Motorcycle exhaust fumes are toxic and poisonous and must not be breathed. Run motorcycle in a well ventilated area where fumes can dissipate.

IMPORTANT NOTICE:
Statements in this instruction sheet preceded by the following words are of special significance:

WARNING
Means there is the possibility of injury to yourself or others.

CAUTION
Means there is the possibility of damage to the engine or motorcycle.

NOTE
Other information of particular importance has been placed in italic type.

S&S recommends you take special notice of these items.

WARRANTY:

All S&S parts are guaranteed to the original purchaser to be free of manufacturing defects in materials and workmanship for a period of six (6) months from the date of purchase. Merchandise that fails to conform to these conditions will be repaired or replaced at S&S's option if the parts are returned to us by the purchaser within the 6 month warranty period or within 10 days thereafter.

In the event warranty service is required, the original purchaser must call or write S&S immediately with the problem. Some problems can be rectified by a telephone call and need no further course of action.

A part that is suspect of being defective must not be replaced by a Dealer without prior authorization from S&S. If it is deemed necessary for S&S to make an evaluation to determine whether the part was defective, a return authorization number must be obtained from S&S. The parts must be packaged properly so as to not cause further damage and be returned prepaid to S&S with a copy of the original invoice of purchase and a detailed letter outlining the nature of the problem, how the part was used and the circumstances at the time of failure. If after an evaluation has been made by S&S and the part was found to be defective, repair, replacement or refund will be granted.

ADDITIONAL WARRANTY PROVISIONS:
(1) S&S shall have no obligation in the event an S&S part is modified by any other person or organization.
(2) S&S shall have no obligation if an S&S part becomes defective in whole or in part as a result of improper installation, improper maintenance, improper use, abnormal operation, or any other misuse or mistreatment of the S&S part.
(3) S&S shall not be liable for any consequential or incidental damages resulting from the failure of an S&S part, the breach of any warranties,the failure to deliver, delay in delivery, delivery in non-conforming condition, or for any other breach of contract or duty between S&S and a customer.
(4) S&S parts are designed exclusively for use in Harley-Davidson motorcycles. S&S shall have no warranty or liability obligation if an S&S part is used in any other application.

Introduction

Installation of S&S Super Stock Big Twin crankcases is comparatively easy and can be performed by any Harley-Davidson repair shop equipped to do complete engine overhauls. No special tools other than those used in normal engine building operations are required. S&S Special Application Big Twin crankcases can be ordered for heavy duty street or race applications. Special Application crankcases ordered for street engines are very similar to Super Stock cases and will be supplied with the same type of hardware. Special Application crankcases for racing engines are a special order part and are machined to customer specifications, so hardware and installation requirements may vary. If Special Application cases are ordered without an alternator cut out for racing, the alternator cut out cannot be machined afterward. All S&S Special Application crankcases must be used with a special S&S Big Twin pinion shaft #33-2040 which is .250" longer than stock.

NOTE - S&S crankcases are sold in matched sets only. Individual case halves are not available.

Kit Contents:

- One set of S&S Super Stock crankcases with following parts installed (see picture x):
  - Left and right main bearing races (right race is final honed and size is marked on tag wired to cases).
  - 1 #31-4008 bushing, oil pump drive shaft (bushing is reamed).
  - 1 #31-4009 bearing assem., cam needle.
  - 8 studs, cylinder (studs installed are appropriate part for type of cases ordered).
  - 1 #31-2006 plug, magnetic drain.
  - 1 #31-2037 shaft, circuit breaker drive gear ('36 to '69 cases).
  - 1 #31-2039 shaft, idler gear ('36 to '69 cases).
- One set of S&S Big Twin crankcase bolts (less two bolts, washers and nuts used to hold cases together for shipping).
- One #31-4013 bearing assem., left main (less races installed by S&S).
- Assorted loose hardware and several hardware packages in the following configurations:
  - 1936 to 1947 Big Twins
    - 1 #31-2005 plug, timing hole
    - 1 #31-2017 spacer, motor mounting
    - 1 #31-2021 fitting, oil line
    - 1 #31-4010 seal, left main bearing oil - '70-up BT
    - 1 #31-4011 spacer, drive sprocket - '70-up BT
    - 1 #31-0000HC hardware pkg. - '36-'64 BT
    - 1 #31-0000HD hardware pkg. - '36-'69 BT
  - 1948 to 1964 Big Twins
    - 1 #31-2021 fitting, oil line
    - 1 #31-0000HA hardware pkg. - '48-up BT
    - 1 #31-0000HC hardware pkg. - '36-'64 BT
    - 1 #31-0000HD hardware pkg. - '36-'69 BT
  - 1965 to 1969 Big Twins
    - 1 #31-2021 fitting, oil line
    - 1 #31-0000HA hardware pkg. - '48-up BT
    - 1 #31-0000HD hardware pkg. - '36-'69 BT
    - 1 #31-0000HE hardware pkg. - '65-'84 BT
  - 1970 to 1984 Big Twins
    - 1 #31-2021 fitting, oil line
    - 1 #31-0000HA hardware pkg. - '48-up BT
    - 1 #31-0000HE hardware pkg. - '65-'84 BT
    - 1 #31-0000HF hardware pkg. - BT alt. left cases
  - 1984 to present Big Twins
    - 1 #31-0000HA hardware pkg. - '48-up BT
    - 1 #31-0000HB hardware pkg. - '84-up BT
    - 1 #31-0000HF hardware pkg. - BT alt. left cases
- Installation instructions.
- Certificate of origin.
- C.A.R.B. approved sticker (crankcases #31-0000, #31-0003, #31-0005, and #31-0012) See Step #8.

Hardware packages listed above include the following parts:

- 31-0000HA - '48-up BT
  - 1 #31-2005 plug, timing hole
  - 1 #31-2010 screen, crankcase oil
  - 1 #31-2011 spring, crankcase oil screen
  - 1 #31-4010 seal, left main bearing oil - '70-up BT
  - 1 #50-8008 o-ring
  - 1 #31-6021 screw, cover
- 31-0000HB - '84-up BT
  - 1 #50-8112 fitting, 45° hose - ⅛" male pipe x ⅛" female pipe
  - 1 #31-2016 switch assem., oil pressure
  - 1 #31-4011 spacer, drive sprocket - '70-up BT
  - 1 #50-8113 fitting, 45° hose - ¼" male pipe x ⅜" male hose
  - 1 #50-8330 plug, SH pipe - ¼-18
  - 2 #50-8331 plug, SH pipe - ⅛-27
  - 1 #50-8115 fitting, hose
- 31-0000HC - '36-'64 BT
  - 2 #50-7019 washer, lock - ¼"
  - 1 #31-2018 fitting, oil line
  - 1 #31-4014 spacer, drive sprocket - '36-'64 BT
  - 1 #50-8331 plug, SH pipe - ⅛-27
  - 2 #50-0015 screw, sltd RH - ¼-20 x ½"
- 31-0000HD - '36-'69 BT
  - 2 #50-7019 washer, lock - ¼"
  - 1 #50-8331 plug, SH pipe - ⅛-27
  - 1 #50-0069 screw, SHS - ¼-20 x ¼"
  - 2 #50-0014 screw, HHC - ¼-20 x ½"
  - 1 #50-0018 screw, HHC - ¼-20 x 1"
- 31-0000HE - '65-'84 BT
  - 1 #31-2019 fitting, primary oil return
  - 1 #31-2020 fitting, rear chain/ "T" oil
  - 1 #31-4011 spacer, drive sprocket - '70-up BT
  - 1 #50-8113 fitting, 45° hose - ¼" male pipe x ⅜" male hose
  - 1 #50-8115 fitting, hose
- 31-0000HF - BT alt. left crankcase
  - 4 #50-0044 screw, SHC - 10-24 x 1"
  - 1 #50-0045 screw, SHS - 10-24 x 5/16"

PRESENT S&S CRANKCASES AND FLYWHEELS ARE NOT COMPATIBLE WITH HARLEY-DAVIDSON ELECTRONIC FUEL INJECTION (EFI) MODELS.

Polishing, painting, plating or powder coating S&S crankcases

S&S Cycle cautions against modifying these crankcases due to the possibility of damaging or weakening them. Modifying S&S crankcases in any fashion voids all manufacturer warranties. Should the customer elect to modify the crankcases regardless, it is imperative that they and the information tag attached to them be inspected beforehand to confirm that the correct model, style, year group, bore size, flywheel diameter, oil pump mounting bolt hole pattern, etc. have been provided. The customer must confirm that crankcases and related parts are correct before assembling them or having them modified in any manner, and assumes all liability for modifications.

The customer must also verify that the serial numbers on the crankcase and attached information tag correspond with those on the certificate of origin and packing carton. Note that all 4" bore Super Sidewinder Long Blocks require Special Application crankcases, which may be identified by the letters "SA" cast into the left crankcase below the serial numbers and into the right crankcase immediately ahead of the front lifter guide opening.

Under no circumstance will S&S be held responsible for expenses related to the modification of any S&S part in the event warranty service is required. Modified parts will not be accepted for credit or exchange. This will apply regardless of cause or fault: customer, retailer, manufacturer, or other.

For further information, contact S&S Technical Services at 608-627-1497, FAX 608-627-1488 or e-mail sstech@sscycle.com

NOTE - "Modification" includes but is not limited to appearance changes such as painting, powdercoating, plating, and polishing. Proper preparation for these procedures as well as the processes themselves may require the use of polishing compounds, chemicals or procedures that are potentially harmful to crankcases.

CAUTION

● **Passages and internal cavities may become obstructed by residues from materials used to polish, paint, plate or powdercoat surfaces. Additionally, surface finishing processes can damage critical machined surfaces. Any of the above may cause premature wear, damage or failure of other engine components as well as the crankcases themselves.**

● **Powder Coating - Subjecting heat-treated alloys such as those used in S&S crankcases to excessive heat can drastically alter their strength and their critical properties. The degree of change depends upon the temperatures reached and the duration of exposure. When powder coating or otherwise processing alloy parts, S&S exposes them to a maximum temperature of 370°F for no longer than 20 minutes. *Under no circumstances should parts be heated past 400°F!***

Please read these instructions thoroughly before starting work. Proceed with the installation only after they are completely understood.

Installation Instructions

1. Inspection

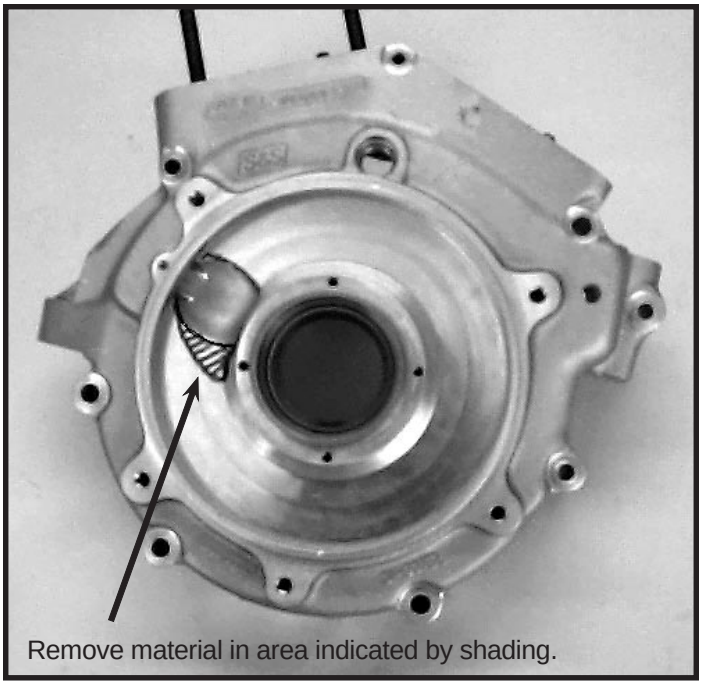
A. Inspect crankcases to confirm that they are correct style and machined for correct bore size, flywheel diameter, oil pump pattern, etc. Refer to tag wired to crankcases.

B. Be sure serial numbers on crankcases match numbers on packing carton and certificate of origin. Contact S&S immediately if numbers do not match.

C. Trial-fit crankcases in frame as described in Section 9.

NOTES

● *Valid certificate of origin is required for any transfer or sale of aftermarket crankcases or complete engines built with aftermarket crankcases. Certificate of origin is required to title and license any motorcycle which is to be driven on public streets and highways.*



Picture 1

● *S&S crankcases manufactured before Fall, 1998, require modification for use with 45 amp Harley-Davidson alternator supplied on '97-up fuel injected Big Twins and available as upgrade kit H-D# 29999-97. See Section 2, Final Preparation, for modification procedure. Performed correctly, 45 amp alternator modification will not void S&S warranty.*

2. Final Preparation

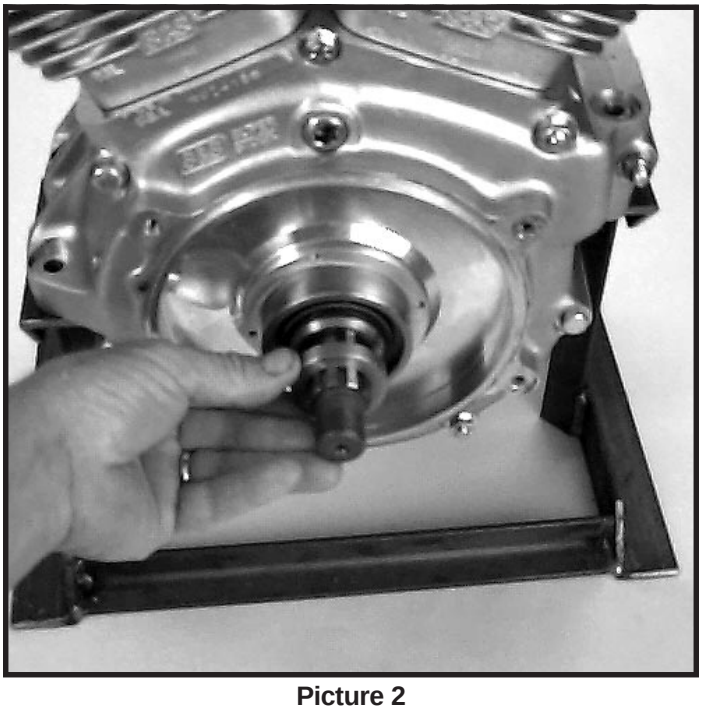
A. *If applicable, modify cases for 45 amp alternator. <u>This step is not required for all models; see preceding note.</u>*

1. Carefully enlarge wiring recess in sprocket side crankcase with mill or hand grinder and remove all metal chips generated during procedure. **See Picture 1.**

NOTE - This step is not necessary in S&S crankcases manufactured with large wiring recess.

CAUTION - Do not increase depth of recess. Remove minimum amount of material that will allow alternator stator to mount on crankcase without crimping wiring harness. Removing excess material may weaken crankcase.

2. After installation of flywheel assembly, S&S drive sprocket spacer #31-4011 and Timken main bearing seal, place S&S spacer #31-4033 (not provided) on sprocket shaft between spacer #31-4011 and alternator rotor. **See Picture 2.** Dimensions of spacer #31-4033 are 1.13" (i.d.) x 1.73" (o.d.) x .325" (thickness).



Picture 2

CAUTION - Failure to use spacer #31-4033 with 45 amp alternator will cause rotor to bottom against crankcase when sprocket nut is tightened, causing damage to crankcase, rotor, or both.
WARNING - To insure safe operation of motorcycle, these operations must be performed correctly and in a professional manner.

3. After completing engine assembly and installing engine in frame, check primary chain run-out according to procedure in H-D Service Manual. Maximum permissible run-out is .030". Prior to operation of motorcycle confirm that primary chain and drive assembly rotate freely and without contacting alternator wiring harness, crankcase, or other components.

WARNING - Incorrect installation of engine or driveline could cause loss of control of motorcycle with serious consequences to operator and other.

B. Clean crankcases in hot soapy water or solvent to remove any dirt or contamination which may have been introduced during shipping, handling, or set-up. If 1973-1980 stock Shovelhead oil pump is to be used, refer to note in section 3-f, Oil Supply Passages, prior to final preparation.

C. Carefully clear all oil passages with compressed air.

WARNING - Compressed air and particles dislodged by compressed air are potentially harmful. Wear protective goggles when using compressed air and always direct air stream away from yourself and others nearby.

3. Hardware Identification and Installation

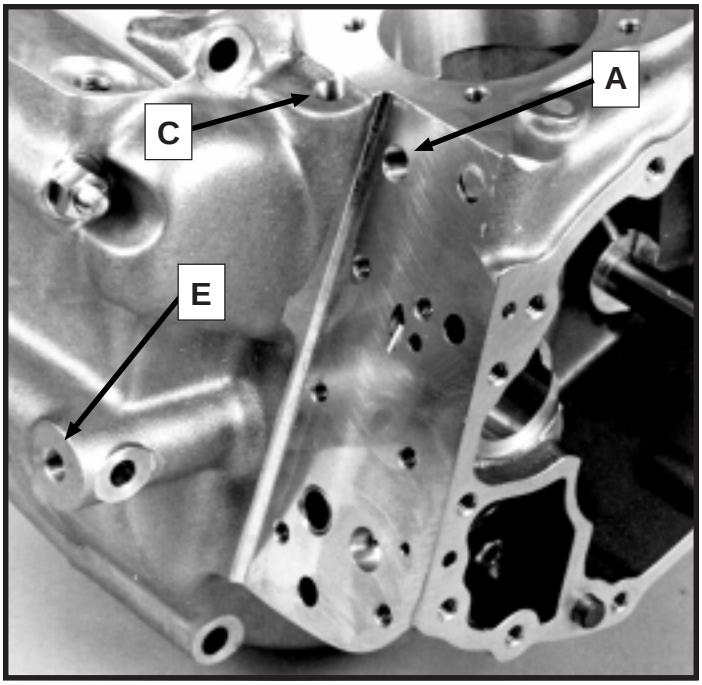
NOTES

● *Some hardware supplied in crankcase kits may not be needed.*

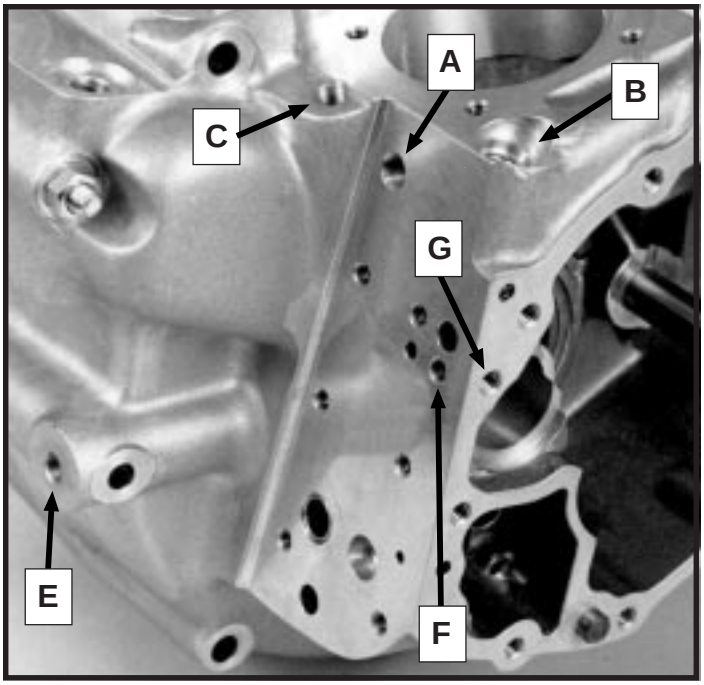
● *When installing hardware, be careful not to cross-thread fittings or damage threads. Damage caused by improper installation of hardware will not be covered under warranty.*

● *To prevent galling, apply anti-seize compound or Teflon tape to threads of all steel fittings prior to installation in crankcase.*

● *If Teflon tape is used, loose tape must not enter crankcase or oil passages. Do not apply tape to first 2-3 threads that screw into hole. If fittings are removed or replaced be sure no tape shreds remain in holes. Tape shred could block oil passages causing restriction of oil flow.*



Picture 3



Picture 4

CAUTION - Restricted oil flow may result in extensive engine damage not covered under warranty.

A. Gear cavity vent passage

Location: Hole A. **See Pictures 3, 4, 5 & 6.**

Hardware: #50-8115 hose fitting or #31-2018 oil line fitting. **See Line Drawings on last page, items #38 and 44.**

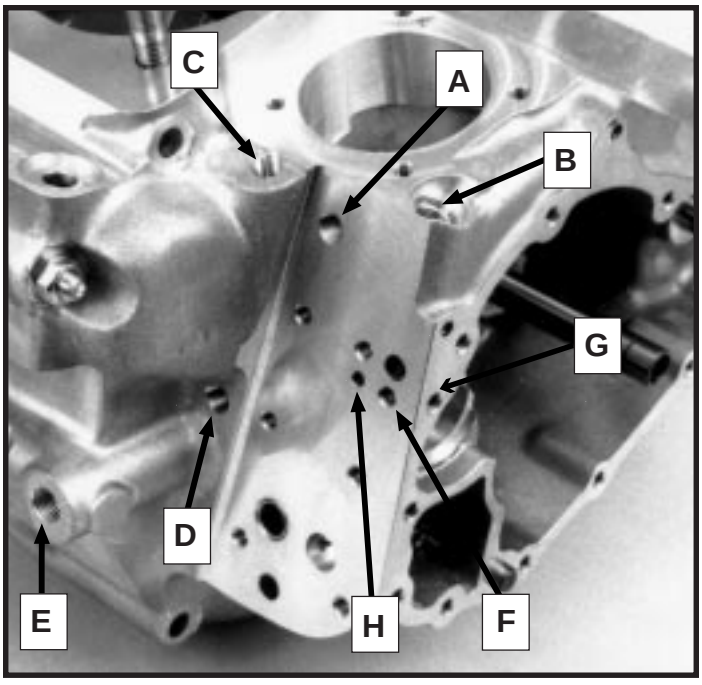
Function: Vents gear cavity. Equalizes pressure in gear case and oil tank. Is also connected to primary chain case in 1965 - 1984 models with dry clutch and engine-supplied primary chain oiling.

Installation: 1936 - 1969

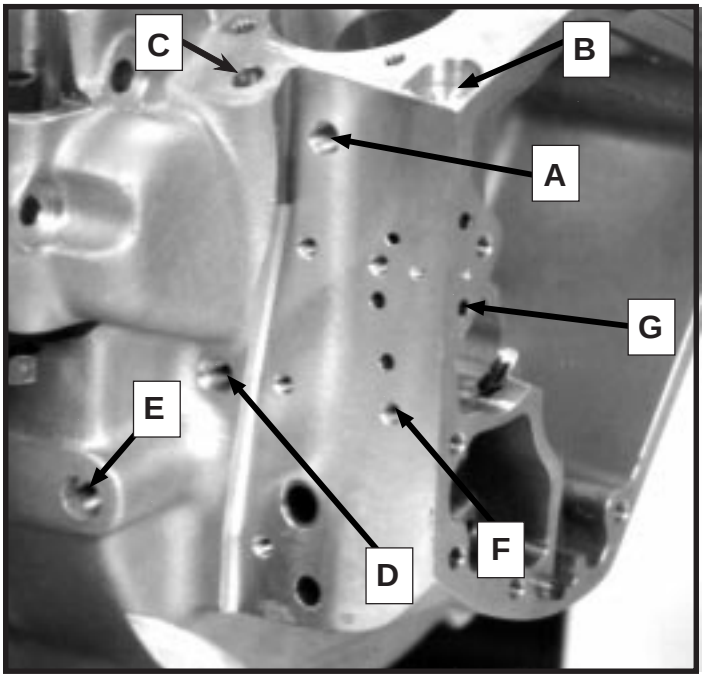
1. Install fitting #31-2018 in hole A.
2. Connect oil vent line from oil tank to fitting.
3. Install t-fitting H-D part #63580-66A if stock 1965-1969 primary chaincase oiling system with dry clutch is desired. **See Picture 7.**

Installation: 1970 - present

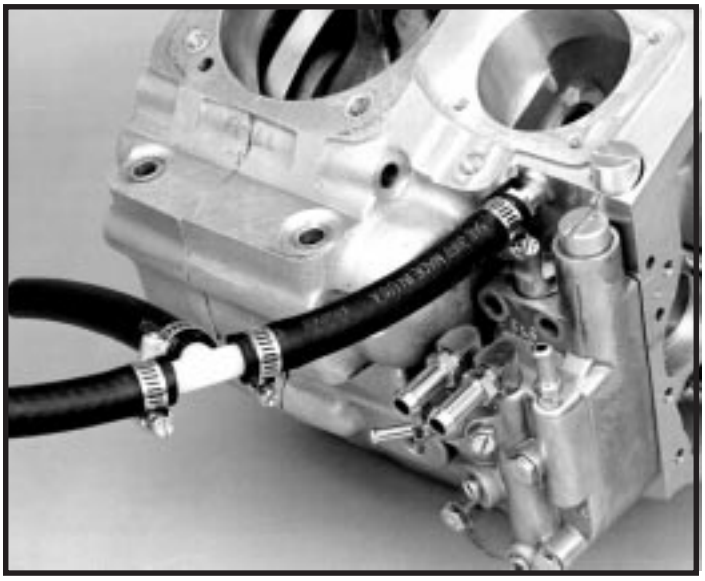
1. Install fitting #50-8115 in hole A.
2. Connect oil line vent from oil tank to fitting.
3. Install t-fitting H-D part #63580-66A if stock '65-early '84 dry clutch and engine-supplied primary chaincase oiling system are desired. **See Picture 7.**



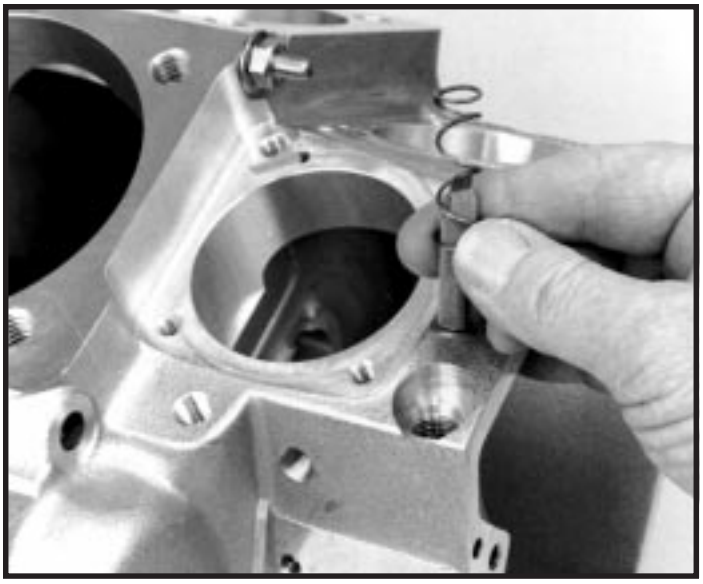
Picture 5



Picture 6



Picture 7



Picture 8

B. Crankcase oil screen assembly
Location: Hole B. **See Pictures 4, 5 & 6.**
Hardware: #31-2010 crankcase oil screen, #31-2011 spring, #50-8008 o-ring, and #31-6021 cover screw. **See Line Drawings, items #15, 16, 17, 18.**
Function: Prevents oil-borne contaminants from reaching tappets and cylinder heads in 1948 and later engines**.**
Installation: All engines 1948 and later.

1. Slip spring over screen and insert in hole B with open end facing down **See Picture 8.**
2. Install cover screw with o-ring in place and tighten with large screwdriver.

NOTE - If screen is removed, be sure to reinstall with open end down and spring placed over screen as in ***Picture 8.***

C. Cylinder head oil supply passage/oil pressure switch hole.
Location: Hole C. See **Pictures 3, 4, 5 & 6.**
Hardware: #31-2021 oil line fitting, #50-8112 45° fitting, #31-2016 oil pressure switch assembly, or #50-8331 socket head pipe plug. **See Line Drawing, items #28, 29, 32, 33.**
Function: Supplies oil to cylinder heads in all Shovelhead engines 1970 to 1984. Alternative source of oil supply to heads for Knuckles and 1963 to 1965. Panheads. Accepts oil pressure switch in V² engines 1984 to present.
Installation: 1970 to 1984 Shovelheads, 1936 - 1947 Knuckles and 1963 - 1965 Panheads with outside oiler heads.

1. Install fitting #31-2021 in hole C.
2. Connect oil line to crankcase fitting and to rocker boxes on Knuckleheads, to cylinder heads on 1963 to 1965 outside oiler Panheads, or to rocker box on Shovelheads.

Installation: 1984 - present V² equipped with oil pressure warning light only.
Install oil pressure switch #31-2016 in hole C.
Installation: 1984 - present V² equipped with oil pressure gauge.

1. Install 45° ⅛" x ⅛" pipe fitting #50-8112 in hole C.
2. Install oil pressure sending unit (HD #74406-87) into #50-8112 fitting.
3. Position oil pressure sending unit to obtain clearance by tilting it away from rear tappet guide. **See Picture 9.**

NOTE- Install ⅛" pipe plug S&S part #50-8331 in hole C if oil pressure switch or pressure gauge is not used.

Picture 9

D. Primary housing oil scavenge passage
Location: Hole D. **See Pictures 5 & 6.**
1965 - early 1984 engines with dry clutch and engine-supplied primary chain oiling.
Hardware: #31-2019 primary oil return fitting and #50-8331 socket head pipe plug. **See Line Drawing, items #33 & 34.**
Function: Hole D leads to vacuum side of crankcase breather gear. Hole D is normally used to scavenge oil from primary chain case in 1965 - early 1984 models with dry clutch and engine-supplied primary oiling.
Installation: 1965 - early 1984 engines with dry clutch and engine-supplied primary chain oiling only.
1. Install fitting #31-2019 in hole D.
2. Connect fitting #31-2019 to oil scavenge fitting on bottom of primary chain case with ⅜" hose.

Installation: 1980 to present engines with primary belt drive or sealed primary and wet clutch.
Install #50-8331 ⅛-27 pipe plug in hole D.

NOTES
● *Plug Hole D with #50-8331 ⅛-27 pipe plug if primary belt drive is used.*
● *Hole D and fitting #31-2019 may be used to return top end oil in engines equipped with external oil return lines. Connect oil return lines from front and rear cylinder heads with "T" fitting. Install fitting S&S #31-2019 in hole D and route remaining line from "T" to this fitting. Breather gear will draw oil from heads into gear case where oil pump can return it to oil tank.*

E. Crankcase vent (breather) passage
Location: Hole E. **See Pictures 3, 4, 5 & 6.**
Hardware: #31-2020 rear chain/ "T" oil fitting, #50-8113 45° hose fitting, or #50-8331 socket head pipe plugs. **See Line Drawing, items #35, 36, 37.**
Function: Vents crankcase to atmospheric pressure. Also used to oil rear drive chain in some models.
Installation: 1936 to 1964 models with crankcase breather stud.
Plug hole E with #50-8331 ⅛-27 socket head pipe plug. Do not overtighten.
Installation: 1965 to 1969 models
1. If separate breather and rear chain oiler are to be used:
   a. Install #50-8113 45° ¼" pipe x ⅜" hose fitting **(See Line Drawing, item #35)** in hole E.
   b. Connect ⅜" ID. hose to #50-8113 fitting. Route ⅜" hose down toward ground or to rear chain. Avoid brake and tire surfaces because oil-air mist exits hose. Hose may also be routed to carburetor air cleaner if desired or required by local emission standards.
   c. Connect rear chain oiler line to rear chain oiler fitting on stock oil pump or S&S oil pump. Avoid brake and tire surfaces because oil-air mist exits hose.

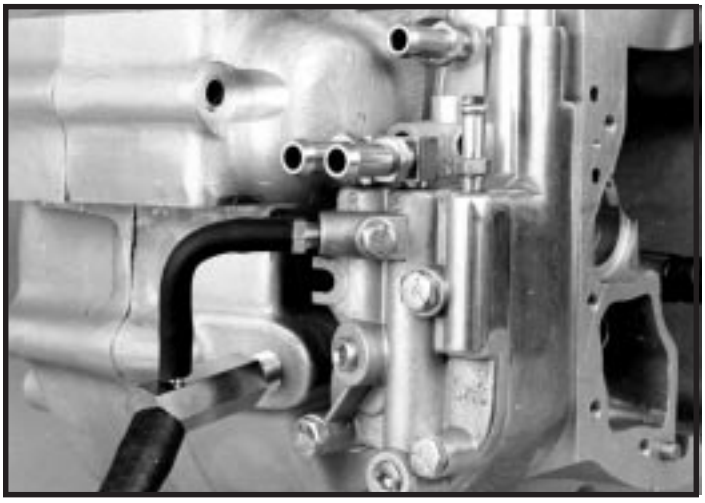
WARNING - Oil on tires or brakes may cause loss of control of motorcycle resulting in serious injury to operator and others.

2. If room allows, breather t-fitting #31-2020 **(See Line Drawing, item #37)** may be installed in hole E. Follow directions below for 1970 to 1979 models.

NOTE - Installation of #31-2020 fitting may not be possible on chassis with mechanical rear brakes due to clearance problems.

Installation: 1970 to 1979 models with rear chain oiler.
1. Install fitting #31-2020 in hole E.
2. Connect 5/16" ID. hose from rear chain oiler fitting on oil pump to small "T" hose nipple on #31-2020 fitting. **See Picture 10.**
3. Connect ⅜" ID. hose to large hose nipple on 31-2020 fitting. Route ⅜" hose to rear drive chain.

Installation: 1980 and later models with crankcase breather vented to carburetor air cleaner.
1. Install #50-8113 45° ¼" pipe x ⅜" hose fitting **(See Line Drawing, item #35)** in hole E.



Picture 10

2. Connect 3/8" hose to #50-8113 fitting and route in stock-like manner to breather fitting on rear of air cleaner backplate.

Installation: 1993 and later style engines with crankcase pressure vented through cylinder heads. Install #50-8330 ¼-18 pipe plug in hole E.

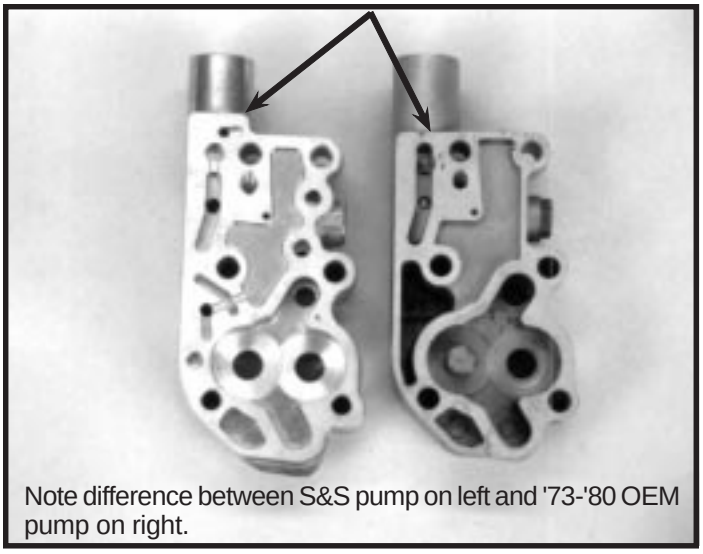
NOTE - Although all S&S crankcases are machined for crankcase breather vent, some late chassis lack sufficient room between crankcase and transmission/ oil tank for correct breather fittings. S&S discourages use of crankcase vent without correct fitting due to possibility of oil reaching rear brakes or tire or abrasive contaminants entering crankcase. In these instances, crankcase pressure must be vented through cylinder heads as on '93-up V²'s. With cylinder head venting, hole E must be plugged for reasons mentioned above. Additionally, leaving hole E open with '93-up OEM style gear cover will cause large oil losses.

F. Oil supply passages
Location: Holes F & G. **See Pictures 4, 5 & 6.**
Hardware: #50-0024 socket head set screw. **See Line Drawing, item #51.**
Installation: See Section 7F, Oil Pump, and important note immediately following Section 7F.

NOTE - Installing stock 1973-1980 Shovelhead oil pump on S&S alternator style crankcase will expose oil passage immediately above crankcase hole for top outside oil pump mounting bolt, resulting in large oil leak. ***See Picture 11.*** *Using S&S oil pump is recommended. Otherwise, passage indicated (**See Picture 12)** must be carefully tapped for 8-32 set screw, and set screw installed with green Loctite. Perform procedure prior to assembling crankcases and carefully remove all metal chips generated during procedure.*

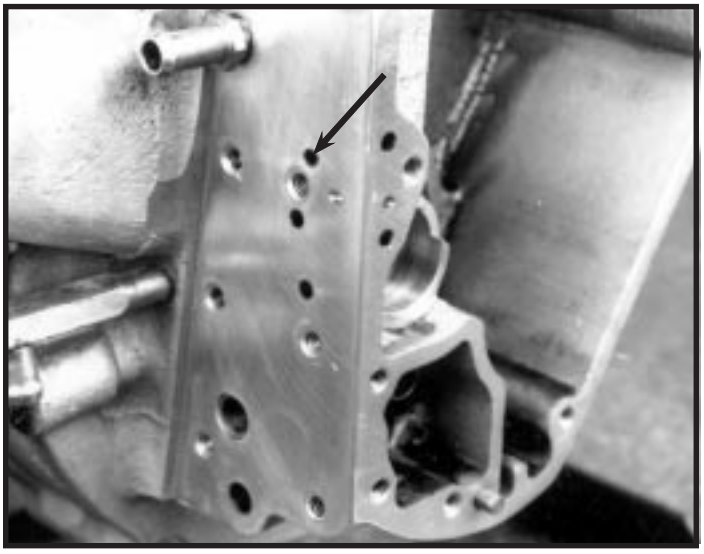
G. Timing mark access hole
All models
Location: Hole A. **See Picture 13.**
Hardware: #31-2005 timing hole plug. **See Line Drawing, item #26**.
Function: Hole serves as access to view timing marks on left flywheel when setting ignition timing.
Installation:
1. Thread plug in hole until it bottoms out against case surface.
2. Tighten plug after ignition timing has been static timed and before starting engine.

H. Assorted screws, washers, etc. **See Line Drawing, items #40, 41, 48, 49, 50.**
All models
Location and function:
#50-0014 ¼-20 x ½" and #50-0018 ¼-20 x 1" hex head cap screws and #50-7019 ¼" lock washers are used to clamp timer assembly down in '36 to '69 engines - ½" screws are for early timers and 1" screw is for later style timers that require separate clamp. #50-0015 ¼-20 x ½" slotted round head screws and #50-7019 ½" lock washers are used to clamp manual timer advance bracket to bracket boss on '36-'64 engines. **See Picture 14.** #50-0044 10-24 x 1" socket head cap screws and #50-0045 10-24 x 5/16" socket head set screw are used to mount alternator stator and clamp wires on cases using alternator left case half.

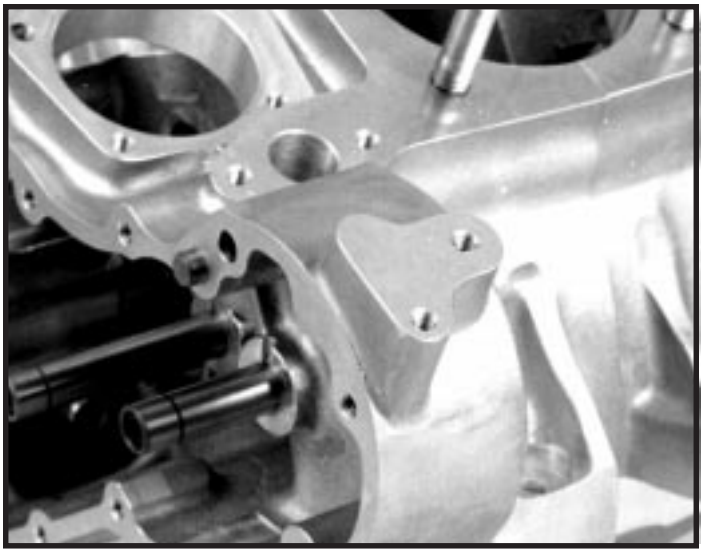


Note difference between S&S pump on left and '73-'80 OEM pump on right.

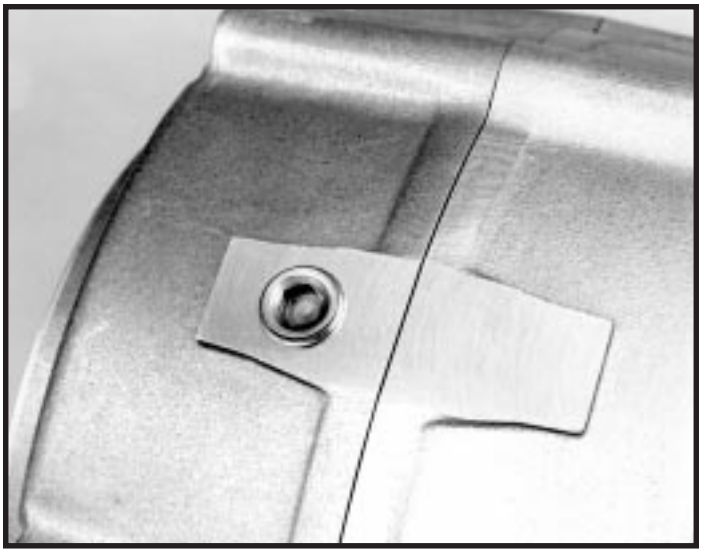
Picture 11



Picture 12



Picture 13



Picture 14

4. Magnetic drain plug

A. Place crankcases in frame to determine if magnetic drain plug #31-2006, located on bottom of cases, will be accessible. If drain plug is obstructed by skid plate, hole must be drilled in skid plate to provide access.

B. Place large amount of clay or putty on skid plate in general area of drain plug. Drain plug will make impression when cases are placed in frame over clay.

C. Remove cases and drill hole in skid plate in location indicated by impression in clay. Hole must be large enough to accommodate removal tool and drain plug.

NOTE - When servicing engine, do not overtighten drain plug. Leave at least 1/16" of plug above surface of crankcase. ***See Picture 15.***

CAUTION - Overtightening drain plug may cause plug to contact flywheels resulting in damage to flywheels and other engine parts.

NOTE - Check magnetic drain plug for metal particles at 500 mile oil change. Break-in of new engine invariably produces fine metal particles. Small accumulation of fine material on magnetic drain plug is normal, and simply shows that drain plug is doing its job. Significant amounts of coarse metal particles or shavings indicate serious engine damage and/or contamination during engine assembly. In this event, engine should be closely inspected before further operation.

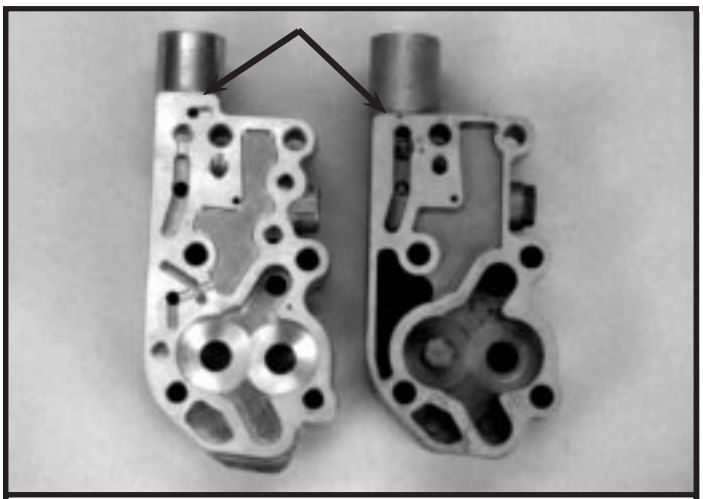
CAUTION - Metal filings, dirt and other contamination in engine oil may cause premature wear and/or irreversible damage to bearings and other engine components.

5. Cylinder studs

Unless otherwise requested, S&S installs appropriate cylinder studs in all S&S crankcases prior to shipment.

A. Crankcases made for Knuckle, Pan, or Shovel type cylinders - Cylinder studs are installed to 1.330" for use with S&S Sidewinder big bore cylinders as well as stock H-D style cylinders. If cylinder base plate is used to increase cylinder height, stud must protrude through gaskets, plate and flange of cylinder far enough to allow full thread engagement of base nut. Top of stud must be at least flush with top of conventional base nut.

NOTE - S&S can provide extra long cylinder studs, part #31-2320, for these applications.



Arrow indicates difference that requires hole illustrated in picture 12 to be plugged if '73-'80 OEM pump used on S&S crankcases.

Picture 15

B. Crankcases made for V² type cylinders - Cylinder studs are installed to stock H-D height which is compatible with stock cylinders or any S&S V² Sidewinder kit. S&S V² Sidewinder kits utilize different length head bolt and washer combinations to compensate for different cylinder heights. These are included in kits with cylinders longer than stock. Builders using kits with stock or shorter than stock cylinders may shorten stock bolts or purchase bolts of correct length from S&S. If cylinder stud height requirement is different than stock and extra long bolts will not work, engine builder must install custom studs with at least .750" of stud thread engagement in crankcase. S&S has produced two styles of cylinder studs for Big Twin V² engines. Part #31-2321, replaces H-D #16937-85C, **(See Figure 1)** and has a single collar. When installed correctly collar contacts crankcase cylinder base gasket surface. Part #31-2323 **(See Figure 2)** has two collars, either of which can be installed against crankcase cylinder deck.

NOTES

● *V² style cylinder studs are easily damaged. Install lengths of ½" ID. rubber or plastic tubing over each stud to prevent nicks and scratches until top end is assembled. Do not use studs as handle to lift or position crankcases.*

● *Unlike early style stock cylinder studs which rely on interference fit between threads of case and stud to hold them in place, S&S studs have standard thread fit and are secured by combination of thread tension and thread locking compound. Late style stock studs, H-D #16937-85C, have same design.*

CAUTIONS

● **Seemingly insignificant damage to studs may cause stress risers which can lead to stud failure and possible damage to engine components.**

● **Insufficient thread engagement between stud and base nut or stud and engine crankcase may result in thread failure and major engine damage.**

WARNING - Thread failure due to insufficient thread engagement could cause violent engine disintegration under power, resulting in loss of control of motorcycle with serious personal injury.

NOTE - Older S&S V² style Sidewinder big bore cylinders may not fit over late style cylinder studs correctly, preventing cylinder from seating on crankcase. ***See Figure 3.*** *Interference may seem minor, but forcing cylinders down over collar may cause distortion of cylinder bore and accelerated wear. Stud holes in S&S cylinders produced after 4-95 have been enlarged to provide adequate clearance.*

CAUTION - Forcing cylinder over stud collar will cause distortion possibly resulting in out of round cylinder bore. Stress created by forcing cylinder over stud may also cause cracking of cylinder, cast-in iron cylinder liner and/or damage or failure of other engine components.

WARNING - Failure of cylinders, pistons and/or other engine components due to cracked cylinder may result in personal injury and/or loss of control of motorcycle.

C. To correct fit of early Sidewinder cylinder on late stud, perform following steps. **See Figure 4.**

1. Place cylinder on table of drill press or milling machine with base gasket surface up.
2. Tighten 31/64" drill bit in chuck and center stud hole of cylinder under drill bit.
3. Clamp cylinder securely in position.
4. Remove 31/64" and install 33/64" or 17/32" drill bit in chuck. Set drill press stop so drill bit will enlarge stud hole .100" to .110" deep below base gasket surface of cylinder.

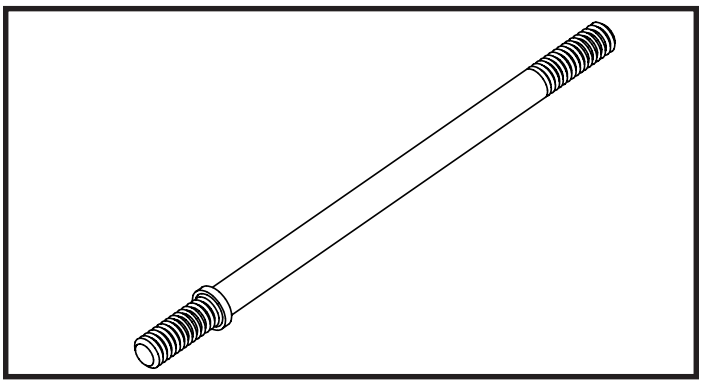


Figure 1

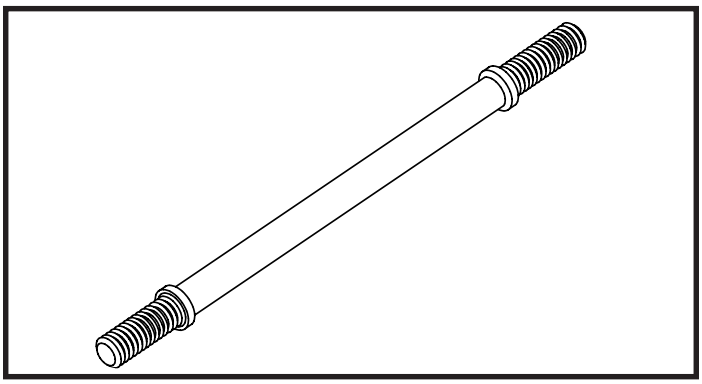


Figure 2

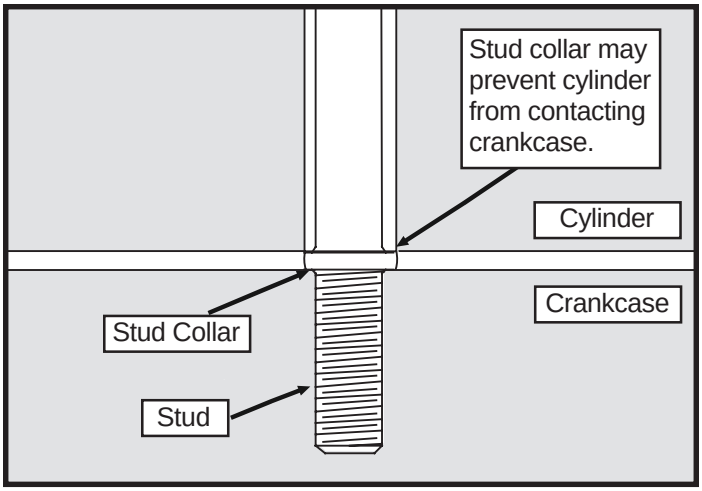


Figure 3

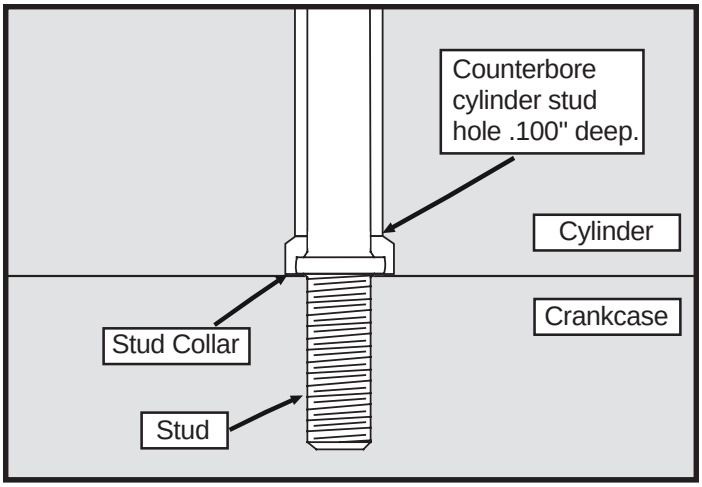


Figure 4

5. Carefully counter bore hole approximately .100" deep. Use fairly low rpm and slow feed rate to avoid catching drill bit and damaging cylinder.
6. Repeat for remaining stud holes.
7. Thoroughly clean all chips and foreign material from cylinder stud holes and oil passages.

CAUTION - Metal filings, dirt and other contamination in engine oil may cause extensive engine damage not covered under warranty.

WARNING - Compressed air and particles dislodged by compressed air are potentially harmful. Wear protective goggles when using compressed air and always direct air stream away from yourself and others nearby.

6. Circuit Breaker Drive Gear and Idler Gear Shafts

S&S ships generator style crankcase kits with circuit breaker drive gear and idler gear shafts pressed and bolted in place. Installation is performed at S&S using a special fixture to insure proper alignment with gear cover. Care must be taken to avoid hitting these shafts during handling and assembly. Prior to installation of flywheel assembly in crankcases, it is recommended that gear cover to be used be slipped over shafts and dowel pins to check fit. (**See Section 7-H, Gear Cover)**. Cover must not be forced on. If resistance is encountered, stop immediately and determine cause. Properly fit gear cover should slide over shafts and pins without difficulty.

CAUTION - Incorrect gear cover fit may cause abnormal stress between gears, gear shafts, pinion shaft and/or camshaft resulting in rapid wear and/ or failure of these components.

7. General Assembly Information

NOTES

● *All S&S crankcase oil pump, tappet guide and gear cover mounting holes are ¼-20 thread. Correct hardware is readily available from most local sources. Early ¼-24 fasteners used in stock crankcase up to 1978 must not be used in S&S crankcase. Damage to cases caused by improper bolts, screws, etc. is not covered under warranty.*

● *To help prevent thread damage, S&S recommends use of anti-seize compound on threads of any steel bolt or fitting installed in aluminum.*

● *S&S recommends high temp resistant RTV premium silicone, ThreeBond 1104 or Hylomar sealant to seal crankcase halves, according to builder's preference. Use any sealant sparingly to prevent excess material from entering crankcase and obstructing passages or contaminating engine oil.*

CAUTIONS

● **Use of hardware with incorrect threads will damage crankcases.**

● **Contaminants in engine oil may block oil passages resulting in damage to critical engine components.**

A. Crankcase bolt torque specifications (See "S&S Crankcase Stud Locations" diagram near line drawing for positions).
1. Position A (¼"): 12 ft. lbs.
2. Positions B to H (5/16"): 15-18 ft. lbs.

B. Other crankcase fastener torque specifications
1. Tappet guide fasteners: 8-10 ft-lbs.
2. Oil pump mounting bolts: 8-10 ft-lbs.
3. Gear cover screws: 8-10 ft-lbs.

S&S Pinion Shaft Main Bearing Fitting Charts

For 1987 and later style bearings.

Chart 1

BT Bearing Race Diameter	Pinion Shaft Bearing Diameter	
	1.2498-1.2500	1.2500-1.2502
1.7511 to 1.7513	**Red** S&S #31-4016 HD #24628-87	**Blue** S&S #31-4018 HD #24643-87
1.7509 to 1.7511	**Blue** S&S #31-4018 HD #24643-87	**White** S&S #31-4005 HD #24626-87
1.7507 to 1.7509	**White** S&S #31-4005 HD #24626-87	**Green** S&S #31-4016 HD #24628-87

Chart 2

Bearing Race Diameter Minus Pinion Shaft Bearing Diameter	Bearing Color Code	
.5005 to .5009	**Green**	S&S #31-4016 HD #24628-87
.5007 to .5011	**White**	S&S #31-4005 HD #24626-87
.5005 to .5013	**Blue**	S&S #31-4018 HD #24643-87
.5011 to .5015	**Red**	S&S #31-4017 HD #24641-87

C. Pinion shaft main bearing fit - Generally, fitment specifications are identical to stock but type of service must be taken into consideration. Bearings in street engines that will receive adequate break-in may be fit on tight side of range to provide longer engine life. Competition engines that will receive little or no break-in should have bearings fit on looser side of range to avoid seizure. All styles of main bearings used from 1958 to present may be used in S&S cases. For simplicity's sake, only 1987 and later style bearing fitment will be covered in these instructions. If 1958 to 1986 style bearings are used, consult H-D service manual for correct fitment procedure.

NOTES

- *Refer to information tag on crankcases for final honed size of pinion shaft main bearing race.*
- *S&S pinion shaft main bearing fitting charts #1 and #2 use H-D bearing color codes.*
- *All measurements must be taken with parts at room temperature, approximately 70° F.*
- *Whatever style bearing is chosen, care must be taken to position entire roller surface to completely contact main bearing race and be completely contained within race.*

CAUTION - Improperly supported main bearings may result in abnormal wear, bearing failure and/ or damage to other internal engine components.

1987 and later style pinion main bearings

1. Fitment method A - Use chart #1.
   a. Refer to information tag on crankcases to determine final honed size of inside diameter of pinion shaft main bearing race.
   b. Measure pinion shaft bearing surface diameter.
   c. Cross reference pinion race inside diameter with pinion shaft bearing surface outside diameter to determine correct color code.

EXAMPLE - Pinion shaft bearing surface diameter measures 1.2499" and is between 1.2498 and 1.2500 in left "Pinion Shaft Bearing Diameter" column. Pinion bearing race inside diameter is 1.7510" and falls between 1.7509 and 1.7511 in middle "Bearing Race Diameter" column. Correct bearing color code where two columns intersect is "BLUE". Selecting color where columns intersect provides proper fit for normal service. If looser fit is desired, select bearing color directly to right of color indicated from selection process. If color indicated from selection process is located in right color column, go to next row directly below and select color in left color column.

2. Fitment method B - Use chart #2.
   a. Refer to information tag on crankcases to determine final honed size of inside diameter of pinion shaft main bearing race.
   b. Measure pinion shaft bearing surface diameter.
   c. Subtract pinion shaft bearing surface diameter from pinion bearing race inside diameter.
   d. Select range in left "Bearing Race Diameter minus Pinion Shaft Bearing Diameter" column where difference best splits high and low parameters of range. Corresponding color bearing set in right "Bearing Color Code" column provides proper fit for regular service.

EXAMPLE - Pinion bearing race inside diameter is 1.7510". Pinion shaft bearing surface diameter is 1.2499". 1.7510" minus 1.2499" is .5011". Difference of .5011" splits ".5009 to .5013" range in third row exactly. Corresponding "BLUE" color code in right column should be used. Notice that .5011" fits in several range groups. Try to select group where difference falls closest to middle of range. If you are not sure, select color that corresponds with group closer to top of chart. This will provide slightly looser bearing fit and help prevent bearing seizure. Selecting next color up on chart may also be done if looser fit is desired for competition applications.

D. Stroker flywheels and connecting rods

1. Flywheels - S&S crankcases feature adequate flywheel crankpin nut to case clearance for strokes up to and including 5". Recommended clearance between flywheels and scraper is .008" - .010". Stock diameter flywheels are 8½"; standard small diameter flywheels 8¼". S&S crankcases can be ordered machined for either or specially machined for as small as 8" diameter.
2. Connecting rods - S&S crankcases feature adequate clearance for most brands of heavy duty connecting rods.

NOTES

● *It is important to confirm flywheel diameter is correct for crankcases. Flywheels that are too large will not fit in crankcases. Flywheels that are too small will leave too large a gap between flywheels and oil scraper resulting in poor oil scavenging and possible oil consumption problems. If flywheel diameter is smaller than diameter crankcases were machined for, scraper should be built up to provide proper clearance at rim of flywheels.*

● *Clearances between crankpin nut - case and connecting rods - case must be checked by engine builder during assembly. Engine damage resulting from improper clearances is not covered under warranty.*

CAUTION - Abnormal contact between moving engine components due to improper clearances may cause premature wear, damage or failure of these parts or other components.

E. Camshaft - 1948 and later

S&S cases have sufficient clearance for lift up to .631" with 1.000" base circle camshaft. If cam with greater lift is to be used, clearance between rear cam lobe and pinion shaft bearing race must be checked and adjusted if necessary. A special pinion shaft bearing race, pre-clearanced for use with cams up to .798" lift with a 1.000" base circle is available. It is especially important to check Knucklehead style cases since most cams available are aftermarket grinds with varying specifications.

F. Breather gear timing - Breather gear window in crankcase is machined to maximum specifications and should require no further machining. In addition, breather passage between flywheel cavity and breather gear bore is cast in a special "ported" shape designed to optimize flow of crankcase vapors and oil mist.

G. Oil pump

1. Oil pump compatibility
   a. 1936 to 1947 (Knucklehead) engines - Original stock cast iron, early stock alloy 1968 to 1969, or S&S #31-6250 oil pump may be used. Passages in crankcase are machined to provide stock-like oil circulation.
   b. 1948 to 1969 (Panhead and Shovelhead) engines - Original stock cast iron, early stock alloy 1968 to 1969, or S&S #31-6250 oil pump may be used. Passages in crankcase are machined to provide stock-like oil circulation. However, if S&S #31-6250 pump is used, builder has option to separate oil supply as in 1973 and later style oiling system. This permits tappets and heads to receive unrestricted oil supply first Lower end main and connecting rod bearings get secondary oil at lower pressure after top end is supplied.
   c. 1970 to present (alternator style) engines - Top end and lower end oil supply passages are separated and pressure relief passage is drilled as in stock late 1981 and later engines. S&S #31-6260 oil pump kit may be used in this application as may SOME stock alloy H-D Shovelhead pump. Most 1973 - 1980 stock pumps leave pressure relief passage in crankcase uncovered**,** resulting in large oil leak (**See Picture 12)**. S&S recommends S&S oil pump for these applications, although stock 1973 - 1980 pump can be used if exposed passage is plugged according to procedure in Section 2-A.

NOTES -

● *Oiling systems in stock 1973 and later engines have two distinct differences from earlier engines. Oil supplies to top end and bottom end are separated, and connecting rod bearings receive constant oil supply through pinion shaft rather than intermittent supply as in earlier engines. Oil supply is separated so tappets/heads get oil first at highest possible pressure. In applications where hydraulic tappets are used, this system maintains high oil pressure to tappets assuring proper operation. After top end components are satisfied, pressure relief valve opens allowing oil to flow to bottom end bearings and other components. After bottom end is satisfied, relief valve opens further allowing excess oil to flow to incoming oil supply passage side of pump. Separate oil supply delivered to bottom end allows change in delivery at pinion shaft from intermittent to constant feed system, hence, end oiling style pinion shaft. S&S recommends separating oil supply in generator style cases when hydraulic tappets are used. This is possible only if S&S #31-6250 style replacement oil pump is used. If stock, cast iron or early alloy pump is used, oil supply cannot be separated and pinion shaft must not be converted to constant oil feed.*

CAUTION - Using stock cast iron oil pump or 1968-1969 alloy pump with constant feed pinion shaft oiling system can result in abnormally low oil pressure with possible engine damage as a result.

● *If stock alloy pump is used, proper identification to confirm it is correct type is imperative. Different year alloy pumps have design changes that could interfere with oil circulation if used with wrong style crankcases. Some early stock alloy pumps will also cause pressure relief passage in S&S crankcase to be uncovered, resulting in large oil leak.*

● *Pump and other parts such as pinion shaft and pinion shaft bushings, rocker shafts and rocker shaft bushings, lifters and lifter guides must be serviceable and in good condition to insure proper oil pressure and circulation.*

CAUTION - Insufficient oil supply may result in premature wear or damage to critical engine components.

2. Crankcase oil supply passages - 1948 to 1969 (generator style) crankcase only **See Pictures 4 & 5.**
   a. Engines using stock cast iron or early stock alloy oil pump assembly or S&S #31-6250 pump and solid tappets
      1. Thread #50-0024 socket head set screw **(See Line Drawing, item #51)** into hole F until it bottoms out.
      2. Top of screw should be flush with or slightly below gasket surface, but screw should not extend deep enough to block oil passage G.
   b. Engines using hydraulic tappets and S&S oil pump #31-6250
      1. Thread #50-0024 socket head set screw **(See Line Drawing, item #51)** into hole G until it bottoms out.
      2. Depth should be between .540" and .600" from gear cover gasket surface. Location of screw should be between holes F and H.
3. Oil pump mounting hardware - Mounting holes are ¼-20 thread. Tighten to 8-10 ft. lbs. Installation hardware is not furnished due wide variety of possible applications. S&S oil pump kits include mounting screws. Screws are also available separately.
   a. Cast iron pump - Use two ¼-20 x 1½" (S&S #50-0080) and four ¼-20 x 2¼" (S&S #50-0019) hex head cap screws and one ¼" lock washer (S&S #50-7019) for each screw.
   b. Alloy pump - Use two ¼-20 x 1½" (S&S #50-0080) and four ¼-20 x 2¾" (S&S #50-0081) hex head cap screws and one ¼" lock washer (S&S #50-7019) for each screw.

H. Tappet guides - Mounting holes in S&S crankcase are ¼-20 thread. Tighten to 8-10 ft. lbs. Mounting screws are not furnished, but are available separately.
1. 1936 to 1978 - S&S cases accept most stock tappet guides. Due to casting variations, however, some early cast iron guides may require minor grinding at corners adjacent to cylinder spigot bore decks. Use four ¼-20 x ⅞" (S&S #50-0068) 12 pt. cap screws and four ¼" (S&S #33-5308) screw adapter washers for each guide. **See Line Drawing, items #13 & 42**.
2. 1979 to present - Use four ¼-20 x ⅞" (S&S #50-0068) 12 pt. cap screws for each guide. **See Line Drawing Item #13 .**

I. Gear cover

NOTES

● *S&S crankcases accept S&S and stock H-D gear covers. Mounting holes are ¼- 20 thread. Tighten to 8-10 ft-lbs. in all applications. Mounting screws are not furnished, but are available separately.*

● *Some aftermarket gear covers have incorrect machining that may cause poor alignment of oil passages, pinion shaft, cam and dowel locations. Incorrect machining on some 1970 to present aftermarket covers may also cause poor alignment between oil passage in gear cover pinion shaft oil supply passage in crankcase.* ***(See Figure 5)****. Additionally, S&S has found some covers to have porosity between pinion shaft oil supply and crankcase breather passages. Result is that high pressure oil intended for top end is diverted to breather cavity or bottom end, starving hydraulic tappets, rocker arms, etc. as a result. Problem may be intensified by heat; as engine temperature increases, oil thins and pressure drops, flywheel cavity becomes flooded with oil, scavenging mechanism becomes overwhelmed and excessive oil is blown out crankcase breather. Engine damage may also occur.*

● *If stock gear cover is used, it must be correct design for year group. 1970 to 1972 style cover could interfere with oil circulation if used with 1973 and later end oiling pinion shaft. Venting crankcase pressure out hole E* ***(See Picture 6)****requires 1973-1992 style gear cover. Operating engine with hole E open and 1993-up style gear cover will cause large oil losses out crankcase.*

● *1973 - 1992 style gear cover must be used if crankcase pressure is vented directly out crankcase rather than through cylinder heads as in 1993-up style Big Twins. S&S recommends venting out hole E in crankcase AND cylinder heads if '92-earlier gear cover and '93-up rocker arm covers are available. S&S supplies all Long Blocks with correct gear cover for dual vent arrangement. S&S rocker covers are compatible with cylinder head venting if umbrella valves are installed correctly (See S&S Rocker Cover Instructions #00-3885). If only cylinder head venting is used, 'hole E in Picture 6 must be plugged.*

CAUTIONS

● **Gear cover misalignment with crankcase alignment dowels, pinion shaft and/or camshaft may cause abnormal stresses resulting in shaft breakage and other engine damage not covered under warranty.**

● **Incorrect oil passage machining in gear cover may cause low oil pressure resulting in extensive engine damage not covered under warranty.**

WARNING

● **Attempting to use '93-up OEM style gear cover on engine with direct crankcase venting will result in large oil losses with possible loss of control of motorcycle and serious injury to operator and others.**

1. Compatibility
   a. 1936 to 1969 engines - Stock H-D or S&S gear covers may be used with S&S generator style crankcases. See notes and cautions above.
   b. 1970 to present - Use appropriate year group, 1970 to 1972, 1973 to 1992 or 1993 to present, stock H-D or S&S gear cover. Do not use 1970 to 1972 type with 1973 and later end oiling pinion shaft. See notes and cautions above.
2. Gearcase mounting hardware
   a. To use stock gear covers with chamfered mounting holes, fasteners with identical chamfers must be used. Some builders have used S&S ¼-20 x ¾" (S&S #50-0072) Phillips oval head screws usually used to install S&S teardrop air cleaner covers. As an alternative, S&S offers special ¼" screw adapter washers, S&S #33-5308 **(See Line Drawing, item #42),** that are used with regular ¼-20 x 1" socket head cap screws such as (S&S #50-0084) or ¼-20 x ⅜" 12 pt. cap screws (S&S #50-0068). Screw thread engagement in cases must be at least ½". To check, install screw and washer, if used, in gear cover and measure amount of screw that protrudes past gear cover gasket surface. Allow for gasket thickness.
   b. Stock gear covers utilize several different length screws with washers. Screws in S&S cover kits are identical in length. They are ¼-20 x 1¼" (S&S #50-0008). Washers supplied are S&S #50-7020.
3. Installation
   a. Thoroughly clean all parts.

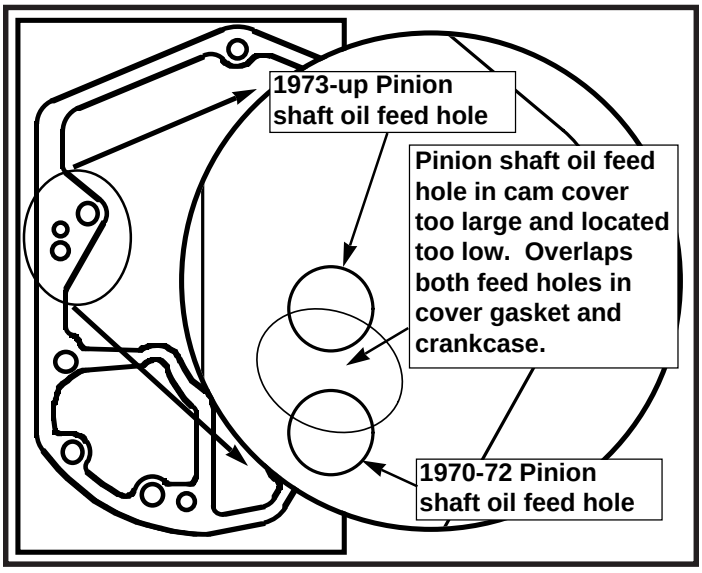

1973-up Pinion shaft oil feed hole
Pinion shaft oil feed hole in cam cover too large and located too low. Overlaps both feed holes in cover gasket and crankcase.
1970-72 Pinion shaft oil feed hole

Figure 5

b. Prior to flywheel installation, slip gear cover over alignment dowel pins in crankcase. Cover must not be forced. If resistance is encountered, determine cause and correct. Remove cover.
c. After flywheels and cases have been assembled but before pinion gear and cam are installed, reinstall gear cover to check fit over pinion shaft. Remove cover.
d. Install pinion gear and camshaft, and repeat step 3. By fitting gear cover in stages, it is easier to pinpoint source and correct alignment problems.

J. Generator/Alternator

1. Generator right case equipped crankcases - S&S generator style crankcases are machined for late style generators that use 5/16" mounting screws and 1.800" dia. centering boss behind gear. Crankcases are not designed for early generators with 1/4" screws and cradle/strap mounting arrangement.
2. Alternator left case equipped crankcases - Latest S&S alternator style crankcases are machined to accept current production H-D rotors and stators. S&S crankcases shipped before late mid-Fall, 1998, may require modification to accept H-D 45 amp alternator. See note in Section 2-A.
3. Use of early plastic coated stators and rotors with diameters greater than 6.470" is not recommended due to insufficient clearance between rear of stator and case and OD of rotor and case. It is possible to clearance cases for these parts, but S&S recommends use of later parts due to increased reliability.

K. 1992 and later style oil filter - All S&S alternator/cone style right crankcases feature 1992 and later style oil filter mounting bosses located just forward of gear cavity. When mounting oil filter or other accessories, use 5/16-18 thread screws of correct length to provide 3/4" minimum thread engagement. To check, install screw and washers, if used, in mounting flange/bracket and measure amount of screw that protrudes past mounting surface.

8. S&S Replacement Crankcases for Pollution-controlled vehicles in California.

S&S crankcase kits, parts #31-0000, 31-0003, 31-0005 and 31-0012, are approved by California Air Resources Board, executive order #D-355-4, as replacements for use on pollution controlled vehicles in California. Supplied with each set of approved crankcases is one-time use C.A.R.B. approved sticker **(See Figure 6)**. This sticker must be applied to frame of motorcycle in visible location, preferably near frame serial number.

Only crankcases with following S&S part numbers are legal replacement for Pollution-controlled vehicles:

#31-0000 - stock bore 1984-91 Big Twin.
#31-0003 - stock bore 1970-84 Big Twin.
#31-0005 - stock bore 1992-up Big Twins (without fuel injection).
#31-0012 - 1984-91 style crankcases for 1984 and earlier frames.

To install sticker perform following steps:

1. Thoroughly clean and dry area to which sticker will be applied.
2. Remove paper backing from sticker.
3. Carefully place sticker in desired position and press sticker on frame of motorcycle.
4. Smooth any wrinkles or air bubbles by gently pressing them outward from center of sticker past edge.

9. Frame

S&S crankcase installation in frame/chassis is essentially the same as stock, although additional clearancing and shimming may occasionally be required. Main areas of concern are between cases and frame motor mounts and, in 1965 to 1969 engines, between cases and primary chain cover.

A. Crankcase to frame motor mount clearance - Checking clearance around and between case mounting bosses and frame is necessary to ensure that crankcase rests squarely on motor mount pad and no stress is applied to crankcases when mounting bolts are tightened.

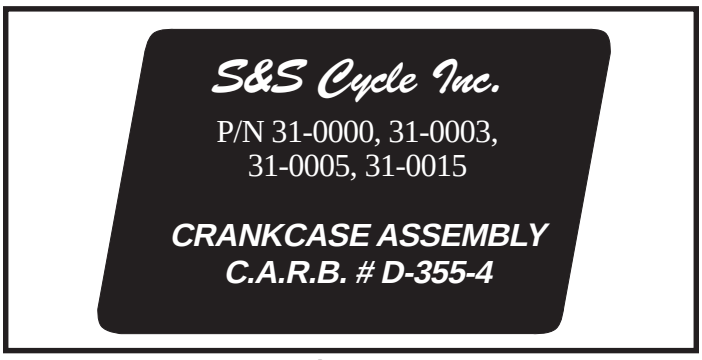


Figure 6

Shimming may be required to compensate for variances between frames.

NOTE - Crankcases damaged by improper installation are not covered under warranty.

CAUTION - Improper alignment of engine and frame mounts may cause abnormal stresses resulting in damage to crankcases or other parts.

To check clearance perform following steps:

1. Assemble case halves using several case alignment studs and several regular case bolts. Snug nuts and bolts. Torquing bolts to final specification is not necessary.
2. Clean frame engine mounts and carefully remove any irregularities from mounting surfaces. Also inspect crankcase mounting bosses for burrs.
3. Position case assembly in frame.
4. Install engine mounting bolts in motor mounts, and check clearance between mounting bosses on cases and frame and any other areas where frame and cases may contact each other. Bolts may be difficult to install if contact is severe.
5. If cases contact frame, remove them and relieve just enough material in offending area to provide clearance.
6. Place cases in frame, install one rear mounting bolt and snug nut.
7. Measure gap between crankcase mounting bosses and frame motor mounts with feeler gauge to determine if shimming is required.
8. If gap exists, fabricate shim just thick enough to fill gap
9. Install opposite corner shim and mounting bolt and nut, and tighten identical to other bolt.
10. Check other corners with feeler gauge to confirm thickness required is same as before. If not, determine cause and correct.

B. Crankcase to primary chain cover on 1965 to 1969 models with cast aluminum primary - Due to casting variations, contact may occasionally occur between inner primary cover and crankcase bolt at position D. **See "S&S Crankcase Stud Locations" diagram insert in line drawing.**

NOTE - Bolting cases and cover together without adequate clearance may create abnormal stress on cover and crankcase

CAUTION - Improper clearance between case bolt and primary chain cover may cause abnormal stress resulting in damage to cover or crankcases.

To check clearance perform following steps:

1. Bolt assembled case halves in frame.
2. Bolt primary cover to case with gasket in place.
3. Check clearance between case bolt at position D and cover. Grind clearance on cover as needed.

Replacement crankcase parts

Use the line drawings to identify required replacement parts. Parts designed to fit as direct stock replacements are listed with corresponding H-D part number. If no H-D part number is shown, S&S part cannot be used in stock application and vice versa.

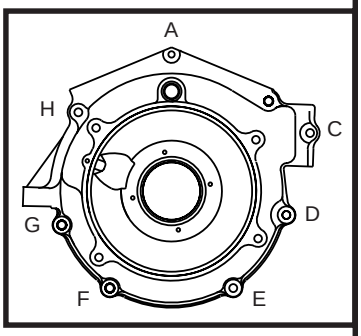
NOTES

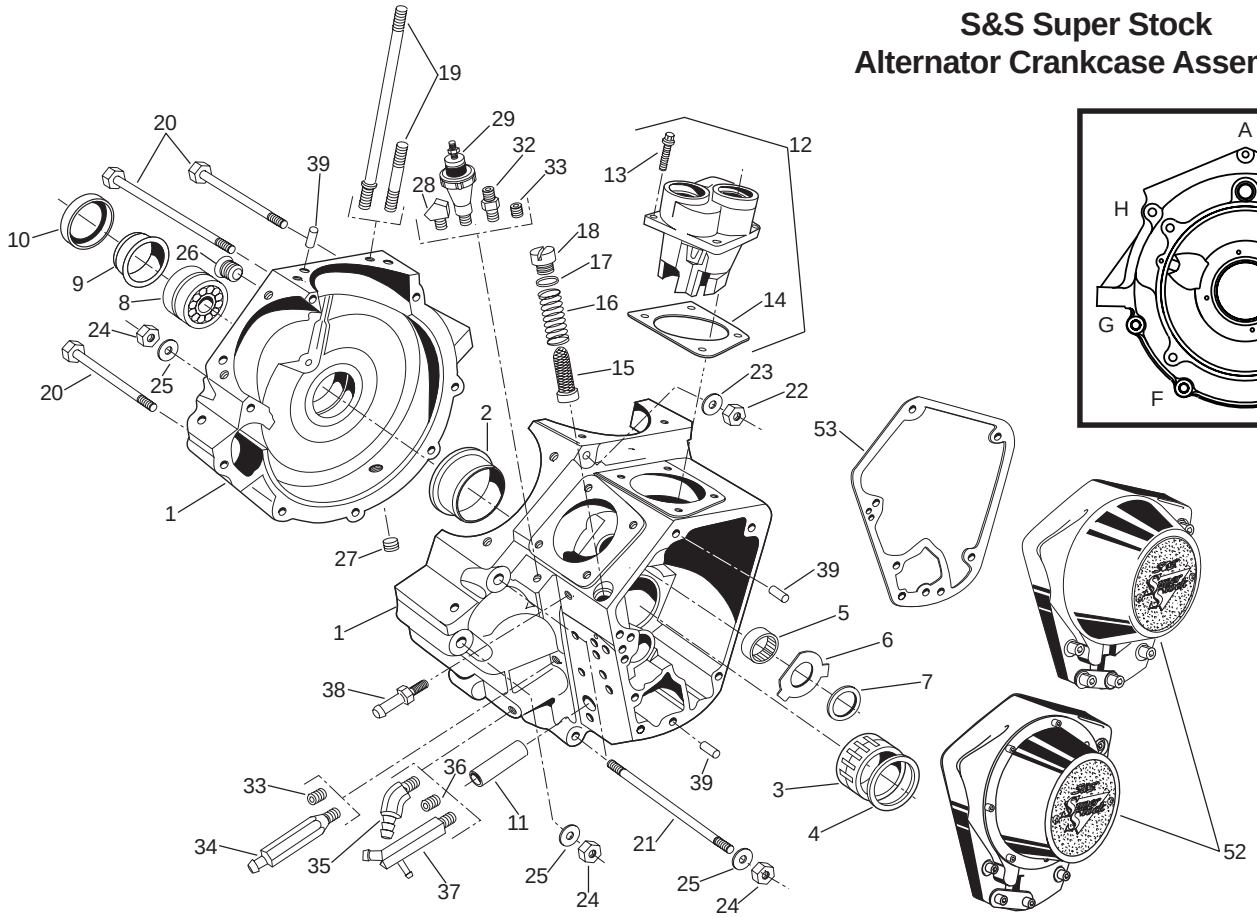
- *Right and left crankcase halves are not available separately.*
- *Parts marked N/A are not available. Parts marked N/S are available but not shown on line drawing.*

S&S Super Stock and Special Application Big Twin Crankcases

1. Crankcase half assembly ..... N/A
2. Right main bearing race - '58-up BT
   - Standard (HD #24599-58B) ..... #31-4004
   - +.002" O.S. (HD#24600-58B) ..... #31-4006
   - +.005" O.S. (HD#24601-58B) ..... #31-4007
   - Std. (clearanced .798" lift V² cam w/1" base circle) ..... #31-4024
   - +.002" O.S. (clear'd .798" lift V² cam w/1" base circle) . #31-4026
   - +.005" O.S. (clear'd .798" lift V² cam w/1" base circle) .. #31-4027
3. Right main bearing assembly - '87-up BT
   - White (HD#24626-87) ..... #31-4005
   - Green (HD#24628-87) ..... #31-4016
   - Red (HD#24641-87) ..... #31-4017
   - Blue (HD#24643-87) ..... #31-4018
4. Main bearing retaining ring - '58-up BT (HD#11177A) . #31-4021
5. Cam needle bearing assem. - '58-up BT (HD#9058) .. #31-4009
6. Cam lockwasher - '58-up BT (HD#25550-57) ..... #33-5201
7. Cam thrust washer - '36-up BT
   - .050" thick (HD#25550-36) ..... #33-5200
   - .055" thick (HD#25551-36) ..... #33-5202
   - .060" thick (HD#25552-36) ..... #33-5203
   - .065" thick (HD#25553-36) ..... #33-5204
   - .070" thick (HD#25554-36) ..... #33-5205
8. Left Timken® main bearing assembly
   - S&S '36-up BT (HD#9028) Stock '69-up ..... #31-4013
   - S&S '70-up SA BT w/1½" dia. sprocket shaft ..... #31-4000
9. Drive sprocket spacer
   - S&S '36-'64 BT ..... #31-4014
   - S&S '65-up BT repl. HD#24002-70 ..... #31-4011
10. Sprocket shaft oil seal
    - S&S '36-up BT (HD#12026A) ..... #31-4010
    - S&S '70-up SA BT w/ 1½" dia. sprocket shaft ..... #31-4002
11. Oil pump shaft bushing - '36-up BT (HD#24641-36) ... #31-4008
12. Tappet guide assembly - '84-up BT
    - Includes 1 each tappet guide, gasket, & 4 screws
    - Front (HD#18542-83A) ..... #33-5301F
    - Rear (HD#18540-83A) ..... #33-5301R
    - Set ..... #33-5301
13. DHH 12 pt. screw - ¼ -20 x ⅞" (HD#3770) ..... #50-0068
14. Tappet block gasket - '48-up BT
    - Front (HD#18634-48C) ..... #33-5302F
    - Rear (HD#18633-48D) ..... #33-5302R
    - Set ..... #33-5302
15. Crankcase oil screen-S&S '48-up BT (HD#24981-70) .. #31-2010
16. Crankcase oil screen spring
    - S&S '48-up BT (HD#24982-70) ..... #31-2011
17. Cover screw oring S&S '48-up BT (HD#11105) ..... #50-8008
18. Cover screw - S&S '48-up BT (HD#26263-80) ..... #31-6021
19. Cylinder stud
    - '36-'84 BT (HD#16837-78) ..... #31-2320
    - '36-'84 BT +5/16 longer ..... #31-2320
    - '85-up BT (HD#16837-85B) ..... #31-2321
    - '86-up XL (HD#16832-86) ..... #31-2331
20. Hex head case bolt (see location diagram)
    - ¼ -28 x 5 ½" (position A '36-up BT) ..... #50-0090
    - 5/16-24 x 5" (HD#3430) (position C '36-up BT) ..... #50-0119
    - 5/16 -18 x 3¾" (pos. H '36-'69 BT, D '65-'69 BT) ..... #50-0011
21. Case alignment stud
    - 5/16 -24 x 5¾" (HD#3506)
    - (position B '36-up BT, E, F, G '70-up BT) ..... #31-2003
    - 5/16 -24 x 6 1/16" (pos. E, F, G '36-'69 BT) ..... #31-2034
22. Hex nut - ¼ -28 repl. HD #7683 ..... Part #50-5011
23. Flat washer - ¼ x ⅝x 1/16 steel repl. HD#6245 ..... Part #50-7021
24. Hex nut - 5/16-24 repl. HD#7833 ..... #50-5023
25. Flat washer - 5/16 x 11/16 x 1/16 steel repl. HD#6702 ..... #50-7034
26. Timing hole plug - S&S '36-up BT (H-D #720) ..... #31-2005
27. Drain plug ..... #31-2006
28. 45° fitting ⅛ pipe x ⅛ pipe ..... #50-8112
29. Oil pressure switch (H-D #26561-84)
    - (incl. 1 ea. switch, nut, & lock washer) ..... #31-2016
30. Lock washer #10 N/S repl. HD#7069 ..... #50-7000
31. Hex nut - 10-32 x ⅜ N/S repl. HD#7634 ..... #50-5000
32. Oil line fitting repl. HD#62484-81 ..... #31-2021
33. Soc. hd. pipe plug - ⅛-27 ..... #50-8331
34. Oil return fitting repl. HD#63533-65 ..... #31-2019
35. 45° fitting - ¼ pipe x ⅜ hose ..... #50-8113
36. Soc. hd. pipe plug
    - ⅛ -27 ('36-'64) ..... #50-8331
    - ¼ -18 ('65-'69) ..... #50-8330
37. "T" fitting repl. HD#63541-70 ..... #31-2020
38. Hose fitting repl. HD#63533-41 ..... #50-8115
39. Dowel pin
    - .370" dia. x ¾ ('36-'69) repl. HD#377 ..... #50-8017
    - .250" dia. x ½ ('70-up) repl. HD#358 ..... #50-8022
40. Soc. hd. cap screw - 10-24 x 1" (stator) N/S (HD#2720) ..... #50-0044
41. Soc. hd. set screw - 10-24 x 5/16 (stator plug clamp) N/S ..... #50-0045
42. Screw adapter washer ..... #33-5308
43. Crankcase breather stud
    - (position D '36-'64 BT) (HD#24912-48) ..... #31-2036
44. Oil line fitting (HD#63533-15) ..... #31-2018
45. Circuit breaker drive gear shaft
    - '36-'69 BT (HD#25856-36) ..... #31-2037
46. Soc. hd. cap screw
    - ¼ -20 x 3¼ (circ. brkr. drive gear shaft) ..... #50-0012
    - ¼ -20 x 2 (idler gear shaft) ..... #50-0013
47. Idler gear shaft - '36-'69 BT (HD#25791-36) ..... #31-2039
48. Lock washer - ¼ (HD#7035) ..... #50-7019
49. Hex hd. cap screw
    - ¼ -20 x 1/2 ('36-'65 timer) ..... #50-0014
    - ¼ -20 x 1" ('66-'69 timer) ..... #50-0018
50. Sltd. rd. hd. screw - ¼ -20 x ½ ..... #50-0015
51. Soc. hd. set screw - ¼ -20 x 5/16 ..... #50-0024
52. Gear cover kit (see gear cover section of catalog for details)
53. Gear cover gasket
    - '36-'69 BT (HD#25225-36C) ..... #31-2030
    - '70-up BT (HD#25225-70B, 25225-93) ..... #31-2031
54. Pinion shaft assembly
    - Standard SA - '81-'89 BT N/S ..... #33-2040
55. Internal retaining ring 1½ diameter left Timken®
    - main bearing assembly N/S ..... #31-4001

S&S Super Stock
Alternator Crankcase Assembly





S&S Super Stock
Generator Crankcase Assembly